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ABSTRACT

This document presents tables for use in converting measurements from one unit to another unit in the same or a different system. Tables are provided for units of length and area in both international and survey systems and for units of volume, capacity (dry and liquid measure), and mass. (SD)

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NBS METRIC INFORMATION

FACTORS FOR HIGH-PRECISION CONVERSION

U.S. CUSTOMARY AND METRIC UNITS

LC1071
July 1976

This Letter Circular updates and supersedes the conversion factors previously published as part of NBS Miscellaneous Publication 286, which is out-of-print. The voluminous tables of MP286 that contain detailed equivalents will not be reissued; the ready accessibility of computers makes the publication of such detailed tables unnecessary.

These conversion factors for length, area, volume, capacity, and weight (mass) also appear as Section 5.4 of NBS LC-1035, *Units and Systems of Weights and Measures - their Origin, Development, and Present Status,* January 1970. LC-1035 is available free from the National Bureau of Standards.

U.S. DEPARTMENT OF COMMERCE / National Bureau of Standards Washington, D.C. 20234

SE 022 298

UNITS OF LENGTH INTERNATIONAL MEASURE*

Units	Inches	Feet	Yards	Miles	Centimeters	Meters
1 inch =	1	0.083 333 33	0.027 777 78	0.000 015 782 83	2.54	0.025 4
1 foot =	12	1	0.333 333 3	0.000 189 393 9	30.48	0.304 8
1 yard =	36	3	1	0.000 568 181 8	91.44	0.914 4
1 mile =	63 360	5280	1760	1	160 934.4	1609.344
1 centimeter =	0.393 700 8	0.032 808 40	0.010 936 13	0.000 006 213 712	1	0.01
1 meter =	39.370 08	3.280 840	1.093 61	0.000 621 371 2	100	1

UNITS OF LENGTH SURVEY MEASURE*

Units	Links	Feet	Rods	Chains	Miles	Meters
1 link =	1	0.66	0.04	0.01	0.000 125	0.201 168 4
1 foot =	1.515 152	1	0.060 606 06	0.015 151 52	0.000 189 393 9	0.304 800 6
1 rod =	25	16.5	1	0.25	0.003 125	5.029 210
1 chain =	100	66	4	1	0.0125	20.116 84
1 mile =	8000	5280	320	80	1	1609.347
1 meter =	4.970 960	3.280 833	0.198 838 4	0.049 709 60	0.000 621 369 9	1

*One international foot = 0.999 998 survey foot (exactly)
One international mile = 0.999 998 survey mile (exactly)
See Section 2.2.d

Note: 1 survey foot = 1200/3937 meter (exactly)
1 international foot = 12 x 0.0254 meter (exactly)
1 international foot = 0.0254 x 39.37 survey foot (exactly)

All underlined figures are exact.

UNITS OF AREA INTERNATIONAL MEASURE*

Units	Square Inches	Square Feet	Square Yards
1 square inch =	1	0.006 944 444	0.000 771 604 9
1 square foot =	144	1	0.111 111 1
1 square yard =	1296	9	1
1 square mile =	4 014 489 600	27 878 400	3 097 600
1 square centimeter =	0.155 000 3	0.001 076 391	0.000 119 599 0
1 square meter =	1550.003	10.763 91	1.195 990

Units	Square Miles	Square Centimeters	Square Meters
1 square inch =	0.000 000 000 249 097 7	6.451 6	0.000 645 16
1 square foot =	0.000 000 035 870 06	929.030 4	0.092 903 04
1 square yard =	0.000 000 322 830 6	8361 273 6	0.836 127 36
1 square mile =	1	25 899 881 103.36	2 589 988.110 336
1 square centimeter =	0.000 000 000 038 610 22	1	0.000 1
1 square meter =	0.000 000 386 102 2	10 000	1

UNITS OF AREA SURVEY MEASURE*

Units	Square Feet	Square Rods	Square Chains	Acres
1 square foot =	1	0.003 673 095	0.000 229 568 4	0.000 022 956 84
1 square rod =	272.25	1	0.062 5	0.006 25
1 square chain =	4 356	16	1	0.1
1 acre =	43 560	160	10	1
1 square mile =	27 878 400	102 400	6400	640
1 square meter =	10.763 87	0.039 536 70	0.002 471 044	0.000 247 104 4
1 hectare =	107 638.7	395.367 0	24.710 44	2.471 044

Units	Square Miles	Square Meters	Hectares
1 square foot =	0.000 000 035 870 06	0.092 903 41	0.000 009 290 341
1 square rod =	0.000 009 765 625	25.292 95	0.002 529 295
1 square chain =	0.000 156 25	404.687 3	0.040 468 73
1 acre =	0.001 562 5	4 046.873	0.404 687 3
1 square mile =	1	2 589 998	258.999 8
1 square meter =	0.000 000 386 100 6	1	0.000 1
1 hectare =	0.003 861 006	10 000	1

*One square survey foot = 1.000 004 square international feet
One square survey mile = 1.000 004 square international miles

All underlined figures are exact.

UNITS OF VOLUME

Units	Cubic Inches	Cubic Feet	Cubic Yards
1 cubic inch =	1	0.000 578 703 7	0.000 021 433 47
1 cubic foot =	1728	1	0.037 037 04
1 cubic yard =	46 656	27	1
1 cubic centimeter =	0.061 023 74	0.000 035 314 67	0.000 001 307 951
1 cubic decimeter =	61.023 74	0.035 314 67	0.001 307 951
1 cubic meter =	61 023.74	35.314 67	1.307 951

Units	Milliliters (Cubic Centimeters)	Liters (Cubic Decimeters)	Cubic Meters
1 cubic inch =	16.387 064	0.016 387 064	0.000 016 387 064
1 cubic foot =	28 316.846 592	28.316 846 592	0.028 316 846 592
1 cubic yard =	764 554.857 984	764.554 857 984	0.764 554 857 984
1 cubic centimeter =	1	0.001	0.000 001
1 cubic decimeter =	1 000	1	0.001
1 cubic meter =	1 000 000	1000	1

UNITS OF CAPACITY DRY MEASURE

Units	Dry Pints	Dry Quarts	Pecks	Bushels
1 dry pint =	1	0.5	0.062 5	0.015 625
1 dry quart =	2	1	0.125	0.031 25
1 peck =	16	8	1	0.25
1 bushel =	64	32	4	1
1 cubic inch =	0.029 761 6	0.014 880 8	0.001 860 10	0.000 465 025
1 cubic foot =	51.428 09	25.714 05	3.214 256	0.803 563 95
1 liter =	1.816 166	0.908 083 0	0.113 510 4	0.028 377 59
1 cubic meter =	1 816.166	908.083 0	113.510 4	28.377 59

Units	Cubic Inches	Cubic Feet	Liters	Cubic Meters
1 dry pint =	33.600 312 5	0.019 444 63	0.550 610 5	0.000 550 610 5
1 dry quart =	67.200 625	0.038 889 25	1.101 221	0.001 101 221
1 peck =	537.605	0.311 114	8.809 768	0.008 809 768
1 bushel =	2 150.42	1.244 456	35.239 07	0.035 239 07
1 cubic inch =	1	0.000 578 703 7	0.016 387 06	0.000 016 387 06
1 cubic foot =	1728	1	28.316 85	0.028 316 85
1 liter =	61.023 74	0.035 314 67	1	0.001
1 cubic meter =	61 023.74	35.314 67	1000	1

All underlined figures are exact.

UNITS OF CAPACITY LIQUID MEASURE

Units	Minims	Fluid Drams	Fluid Ounces	Gills
1 minim =	1	0.016 666 67	0.002 083 333	0.000 520 833 3
1 fluid dram =	60	1	0.125	0.031 25
1 fluid ounce =	480	8	1	0.25
1 gill =	1920	32	4	1
1 liquid pint =	7680	128	16	4
1 liquid quart =	15 360	256	32	8
1 gallon =	61 440	1024	128	32
1 cubic inch =	265.974 0	4.432 900	0.554 112 6	0.138 528 1
1 cubic foot =	459 603.1	7660.052	957.506 5	239.376 6
1 milliliter =	16.230 73	0.270 512 2	0.033 814 02	0.008 453 506
1 liter =	16 230.73	270.512 2	33.814 02	8.453 506

Units	Liquid Pints	Liquid Quarts	Gallons	Cubic Inches
1 minim =	0.000 130 208 3	0.000 065 104 17	0.000 016 276 04	0.003 759 766
1 fluid dram =	0.007 812 5	0.003 906 25	0.000 976 562 5	0.225 585 94
1 fluid ounce =	0.062 5	0.031 25	0.007 812 5	1.804 687 5
1 gill =	0.25	0.125	0.031 25	7.218 75
1 liquid pint =	1	0.5	0.125	28.875
1 liquid quart =	2	1	0.25	57.75
1 gallon =	8	4	1	231
1 cubic inch =	0.034 632 03	0.017 316 02	0.004 329 004	1
1 cubic foot =	59.844 16	29.922 08	7.480 519	1728
1 milliliter =	0.002 113 376	0.001 056 688	0.000 264 172 1	0.061 023 74
1 liter =	2.113 376	1.056 688	0.264 172 1	61.023 74

Units	Cubic Feet	Milliliters	Liters
1 minim =	0.000 002 175 790	0.061 611 52	0.000 061 611 52
1 fluid dram =	0.000 130 547 4	3.696 691	0.003 696 691
1 fluid ounce =	0.001 044 379	29.573 53	0.029 573 53
1 gill =	0.004 177 517	118.294 1	0.118 294 1
1 liquid pint =	0.016 710 07	473.176 5	0.473 176 5
1 liquid quart =	0.033 420 14	946.352 9	0.946 352 9
1 gallon =	0.133 680 6	3785.412	3.785 412
1 cubic inch =	0.000 578 703 7	16.387 06	0.016 387 06
1 cubic foot =	1	28 316.85	28.316 85
1 milliliter =	0.000 035 314 67	1	0.001
1 liter =	0.035 314 67	1000	1

All underlined figures are exact.

UNITS OF MASS NOT LESS THAN AVOIRDUPOIS OUNCES

Units	Avoirdupois Ounces	Avoirdupois Pounds	Short Hundredweights	Short tons
1 avoirdupois ounce =	1	0.0625	0.000 625	0.000 031 25
1 avoirdupois pound =	16	1	0.01	0.000 5
1 short hundredweight =	1 600	100	1	0.05
1 short ton =	32 000	2 000	20	1
1 long ton =	35 840	2 240	22.4	1.12
1 kilogram =	35.273 96	2.204 623	0.022 046 23	0.001 102 311
1 metric ton =	35 273.96	2204.623	22.046 23	1.102 311

Units	Long Tons	Kilograms	Metric Tons
1 avoirdupois ounce =	0.000 027 901 79	0.028 349 523 125	0.000 028 349 523 125
1 avoirdupois pound =	0.000 446 428 6	0.453 592 37	0.000 453 592 37
1 short hundredweight =	0.044 642 86	45.359 237	0.045 359 237
1 short ton =	0.892 857 1	907.184 74	0.907 184 74
1 long ton =	1	1016.046 908 8	1.016 046 908 8
1 kilogram =	0.000 984 206 5	1	0.001
1 metric ton =	0.984 206 5	1 000	1

All underlined figures are exact.

Units	Grains	Apothecaries Scruples	Pennyweights	Avoirdupois Drams
1 grain =	$\frac{1}{}$	0.05	0.041 666 67	0.036 571 43
1 apoth. scruple =	$\frac{20}{}$	$\frac{1}{}$	0.833 333 3	0.731 428 6
1 pennyweight =	$\frac{24}{}$	$\frac{1.2}{}$	$\frac{1}{}$	0.877 714 3
1 avdp. dram =	27.343 75	1.367 187 5	1.139 323	$\frac{1}{}$
1 apoth. dram =	$\frac{60}{}$	$\frac{3}{}$	$\frac{2.5}{}$	2.194 286
1 avdp. ounce =	437.5	21.875	18.229 17	$\frac{16}{}$
1 apoth. or troy ounce =	$\frac{480}{}$	$\frac{24}{}$	$\frac{20}{}$	17.554 29
1 apoth. or troy pound =	$\frac{5\ 760}{}$	$\frac{288}{}$	$\frac{240}{}$	210.651 4
1 avdp. pound =	$\frac{7\ 000}{}$	$\frac{350}{}$	291.666 7	$\frac{256}{}$
1 milligram =	0.015 432 36	0.000 771 617 9	0.000 643 014 9	0.000 564 383 4
1 gram =	15.432 36	0.771 617 9	0.643 014 9	0.564 383 4
1 kilogram =	15432.36	771.617 9	643.014 9	564.383 4

Units	Apothecaries Drams	Avoirdupois Ounces	Apothecaries or Troy Ounces	Apothecaries or Troy Pounds
1 grain =	0.016 666 67	0.002 285 714	0.002 083 333	0.000 173 611 1
1 apoth. scruple =	0.333 333 3	0.045 714 29	0.041 666 67	0.003 472 222
1 pennyweight =	$\frac{0.4}{}$	0.054 857 14	$\frac{0.05}{}$	0.004 166 667
1 avdp. dram =	0.455 729 2	$\frac{0.062\ 5}{}$	0.056 966 15	0.004 747 179
1 apoth. dram =	$\frac{1}{}$	0.137 142 9	$\frac{0.125}{}$	0.010 416 67
1 avdp. ounce =	7.291 667	$\frac{1}{}$	0.911 458 3	0.075 954 86
1 apoth. or troy ounce =	$\frac{8}{}$	1.097 143	$\frac{1}{}$	0.083 333 333
1 apoth. or troy pound =	$\frac{96}{}$	13.165 71	$\frac{12}{}$	$\frac{1}{}$
1 avdp. pound =	116.666 7	$\frac{16}{}$	14.583 33	1.215 278
1 milligram =	0.000 257 206 0	0.000 035 273 96	0.000 032 150 75	0.000 002 679 229
1 gram =	0.257 206 0	0.035 273 96	0.032 150 75	0.002 679 229
1 kilogram =	257.206 0	35.273 96	32.150 75	2.679 229

Units	Avoirdupois Pounds	Milligrams	Grams	Kilograms
1 grain =	0.000 142 857 1	64.798 91	0.064 798 91	0.000 064 798 91
1 apoth. scruple =	0.002 857 143	1295.978 2	1.295 978 2	0.001 295 978 2
1 pennyweight =	0.003 428 571	1555.173 84	1.555 173 84	0.001 555 173 84
1 avdp. dram =	0.003 906 25	1771.845 195 312 5	1.771 845 195 312 5	0.001 771 845 195 312 5
1 apoth. dram =	0.008 571 429	3887.934 6	3.887 934 6	0.003 887 934 6
1 avdp. ounce =	$\frac{0.062\ 5}{}$	28 349.523 125	28.349 523 125	0.028 349 523 125
1 apoth. or troy ounce =	0.068 571 43	31 103.476 8	31.103 476 8	0.031 103 476 8
1 apoth. or troy pound =	0.822 857 1	373 241.721 6	373.241 721 6	0.373 241 721 6
1 avdp. pound =	$\frac{1}{}$	453 592.37	453.592 37	0.453 592 37
1 milligram =	0.000 002 204 623	$\frac{1}{1000}$	0.001	0.000 001
1 gram =	0.002 204 623	1 000 000	$\frac{1}{1\ 000}$	0.001
1 kilogram =	2.204 623			$\frac{1}{}$

All underlined figures are exact.

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